

STRATUM GROUP

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May 14, 2019

Malcolm Dorn
Port Townsend Preservation Alliance
1037 Lawrence Street
Port Townsend, WA 98368
dmalcolmdorn@gmail.com

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DSD

Re: Geology Hazard Assessment

Jefferson County Parcels 001034001, 001034002, 001034038, 001034039, 001034040
and 00103041
Discovery Road and San Juan Avenue
Port Townsend, Washington

Dear Mr. Dorn:

We visited the properties southwest of the intersection of Discovery Road and San Juan Avenue to assess the potential geology hazards at the site. The purpose of the site visit was to assess the geologic stability of the site including the criteria set forth in City of Port Townsend's Environmentally Sensitive Areas (ESA) Ordinance, PTMC 19.05. It is our understanding that there are plans to develop the subject properties as a mixed-use area that will include residential and commercial buildings.

Based on our geology inspection of the property and vicinity, and a review of readily available geologic information on the site, it is our opinion that the subject properties are not a geologically hazardous area per *PTMC 19.05.100.C*. Furthermore, development of the site will not increase the risk of instability on other sites in the area.

This geology hazard assessment included a field inspection of the subject property and vicinity including the slopes on the property. Our evaluation also included review of available geologic mapping, lidar (light detecting and ranging) imagery and our own notes and observations we have made in the vicinity of the site and at locations with similar geologic conditions

GENERAL GEOLOGY

The *Geologic Map of the Port Townsend South and Part of the Port Townsend North 7.5-minute Quadrangles, Jefferson County, Washington* (Schasse and Slaughter, 2005) indicates that the subject property and vicinity are located in an area underlain by glacial till and glacial marine drift (Figure 1).

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Figure 1. Annotated geologic map (Schasse and Slaughter, 2005) showing the subject property location. Qgt = Vashon till, Qgdm_e = Everson Glaciomarine Drift, Qml = modified land.

The till was deposited directly by glacial ice during the last glacial period approximately 18,000 to 14,000 years ago and consists of a poorly sorted mix of sediments ranging from silt through boulders.

The glacial marine sediments were deposited during the late stages of the last glacial period when the glacial ice thinned and the area was inundated with shallow sea water. The mass of the glacial ice had pushed the land surface downward hundreds of feet and when the ice thinned the area became submerged prior to the land rebounding from the glacial load. Glacial ice was likely still present in the vicinity and floating on the water and sediment melting out of the ice was deposited on the underlying area. When the area rebounded and emerged some reworking of the sediment would have taken place by local water action.

Site observations on the subject property including hand dug test pits and observations of slopes in the vicinity of the subject property are consistent with the above-described mapping. The site is underlain by silty sandy gravel and cobbles as well as boulders from the surface to a depth of at least 4 feet. The interpretation of the higher portions of the site being glacial till and the lower portions being consistent of glacial till deposits is consistent with lidar imagery of the site; however, distinguishing the units in the field is challenging as they are of similar composition

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and density in the upper soil layers. The lidar suggests that there may be some reworked wave cut terrace areas on the site, but there is some evidence of past soil grading due to thin top soil.

SPECIFIC SITE OBSERVATIONS

An aerial image of the site with pertinent features marked is provided in Figure 2 on the following page. The subject property is located in a residential area with homes and small commercial businesses on the adjoining properties to the north, northwest and south and a golf course to the east. San Juan Avenue bounds the site to the east and Discovery Road bounds the site to the north and northwest.

The site consists of grass covered pasture land that generally slopes to the east. The slopes are undulating with areas that are nearly level. A few glacial erratic boulders are located on the surface of the site. Soils underlying the site consist of sandy gravel with silt to gravelly sand with silt. The soils are hard and/or dense throughout at depth in test pits dug to a depth of 4 feet. Some areas on the north portion of the site appeared to have very thin top soil suggestive of past grading or minor surface mining for gravel.

Slopes on site are mostly gentle with moderate undulations. The steepest slope area is located on the north central portion of the site. This slope is approximately 40 percent with a height of approximately 8 feet. Based on the lidar imagery of the site, this slope appears to have been the result of some minor soil mining or grading. This observation is consistent with top soils in this area being very thin.

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Figure 2. Aerial view of site (Jefferson County GIS, 2012)

Property is outlined in red.

Green outline is area of 40 percent slope. Note 40 percent slope area is less than 10 feet in height.

No areas of wet soil or seeps were present on the subject property at the time of our site visit. No indications of slope instability are present on the slopes or in the vicinity of the subject property.

A cut slope is located along a portion of the southeast edge of the property where San Juan Avenue cut through the lower end of the slope. The cut slope is more than 40 percent but is less than 10 feet high. No slope movement could be seen on the cut slope. Another cut slope is located along a portion of the northwest side of the slope where Discovery Road was cut into the slope and the slope is lined with a rockery. This slope is less than 10 feet as well and there is no indication of past movement.

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Port Townsend Geology Hazard Code Review

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As per *Port Townsend's Code 19.05.100 C 1* through 4, the following classification criteria were evaluated to determine if the subject property is located in a geologically hazardous area. Based on this evaluation and the conditions described in the above sections, the properties do not meet the criteria for a *geologically hazardous area*.

19.05.100.C.1: Erosion Hazard Areas. Areas Any area containing soil or soil complexes described or mapped within the United States Department of Agriculture/Soil Conservation Service Soil Survey for Jefferson County as having a severe to very severe erosion hazard potential.

Soils underlying the site consist of gravelly sandy loam or sandy gravelly loam and site observations indicate that the site is not prone to severe erosion potential as the soil on the site is well drained. The USDA map indicates the soils on the site are San Juan sandy gravelly loam and Hoypus gravelly loamy sand. These soils are not subject to severe erosion.

19.05.100.C.2.a: Landslide Hazard Areas. Areas of historic failures, such as: i. Those areas delineated by the USDA's Natural Resources Conservation Service as having a "severe" limitation for building site development; ii. Those areas mapped by Ecology (Coastal Zone Atlas) or Washington Department of Natural Resources (WDNR) (slope stability mapping) as unstable (U or Class 3), unstable old slides (UOS or Class 4), or unstable recent slides (URS or Class 5); iii. Areas designated as landslides on maps published by the USGS or WDNR; or iv. Areas mapped in the Liquefaction Susceptibility Map of Jefferson County published by the Washington Department of Natural Resources;

The subject properties are not designated or mapped as an unstable area, landslide hazard area, or liquefaction hazard area on any of the above referenced maps.

19.05.100.C.2.b: Landslide Hazard Areas. Areas with all three of the following characteristics: a. Slopes steeper than 15 percent; b. Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and c. Springs or ground water seepage;

Portions of the property have slopes that exceed 15% along the central area of the side in a generally alignment from southeast to northwest. However, no intersection of geologic contacts of permeable material over impermeable sediment is present and no seeps, springs or perched water was noted anywhere on the slopes of the property or on the slopes below the property. No indications of potentially unstable slopes were observed on the site or adjoining sites.

19.05.100.C.2.c: Landslide Hazard Areas. Any area potentially subject to mass movement due to a combination of geologic, topographic, and hydrologic factors, but not limited to those areas

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mapped or described by the Soil Conservation Service, the Washington State Department of Ecology, Department of Natural Resources or U.S. Geologic Service. These classifications may be based on performance standards rather than mapping;

No indications of mass wasting are apparent on the subject property or vicinity. The lack of perched water zones, relatively gentle slopes, lack of convergent topography, underlying glacial till or glacial marine drift all indicate that the site and vicinity are stable.

19.05.100.C.2.d: Landslide Hazard Areas. Any area potentially unstable or subject to erosion or sloughing as a result of rapid stormwater runoff, soil saturation or undercutting by wave action;

The subject property is not in an erosion area of any streams and is not in a shoreline area. No evidence of surface water flow or indications of erosion were present on the site. The upper soils underlying the site are well drained and are not subject to saturation as long as stormwater is dispersed or not concentrated on the site.

19.05.100.C.2.e: Landslide Hazard Areas. Any slope of 40 percent or steeper that exceeds a vertical height of 10 feet over a 25-foot horizontal run;

A limited area of 40 percent slope is present on the north central portion of the site. However, this limited 40 percent slope area is less than 10 feet in height. Slopes were measured via clinometer, tape, and pace. Short areas of road cut by Discovery Road at the northwest edge of the site and San Juan at the southeast edge of the site are greater than 40 percent, but are less than 10 feet in height.

19.05.100.C.3: Earthquake Hazard Areas. Areas subject to severe risk of damage as a result of earthquakes, slope failure, settlement, soil liquefaction or faulting. These areas are identified by the presence of poorly drained soils (greater than 50 percent silt and less than 35 percent coarse material) loose sand or gravel, peat, artificial fill and landslide materials or soils with a high organic content.

The properties are not underlain by potentially liquefiable soils as soils are well drained and are too coarse grained for liquefaction to be an issue on the site.

19.05.100.C.4: Tsunami Hazard Areas Tsunami hazard areas are coastal areas and large lake areas susceptible to flooding and inundation as the result of excessive wave action derived from seismic or other geologic events. These areas have been mapped by WDNR.

The subject properties are located well away from any shoreline areas and are not subject to tsunamis.

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CONCLUSION AND RECOMMENDATIONS

Based on our geology inspection of the property and vicinity, and a review of readily available geologic information on the site, it is our opinion that the subject properties are not a geologically hazardous area per *PTMC 19.05.100.C*. The subject properties are not subject to landsliding or rapid erosion. Development of the site can be accomplished with typical foundation work. Roof gutters and the down spout systems as well as driveway areas should either direct water into approved storm water systems or should be dispersed into the ground in such a manner as to avoid concentrating surface water discharge and consistent with Port Townsend stormwater regulations.

Stratum Group appreciates the opportunity to be of service to you. Should you have any questions regarding this assessment please contact our office at (360) 714-9409.

Sincerely yours,
Stratum Group



Dan McShane, L.E.G., M.Sc.
Licensed Engineering Geologist



Geoff Malick, G.I.T. M.Sc.
Geologist-in-Training



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